**Pre-Post Assessment**

**Unit Introduction**

Probability is an exciting unit. The concepts behind probability are quite abstract and sometimes difficult for students to grasp. Although the 6th grade math students at Tyee Middle School in Bellevue come with different levels of understanding and experience with probability, this is the students’ first formal experience with probability in the Bellevue School District. The unit requires students to delve deeply into probability concepts and skills, including compound situations, expected value, and the purposeful design of a game to achieve a specific outcome. The unit takes a full month of lessons. One challenge is students have two separate, one-week breaks during the unit. One week is spring vacation week; the second week is for 6th grade camp. Careful timing of lessons and assessments will benefit student learning and chunk concepts meaningfully.

One of my main overarching goals for the unit is for all students to feel confident and comfortable discussing and dealing with probability concepts and solving probability problems. It has been my experience that probability, being so abstract, can be a confusing unit. Continually assessing students for learning is a priority and I paced the unit to ensure ample time to re-teach, expand, or reinforce material if needed. The essential questions that frame this unit are:

1. In what ways is probability part of my life?
2. How does probability influence or contribute to my decision-making?
3. What patterns do I see and how does that impact me?
4. How does this relate to what I already know?
5. How does this help me make sense of the world?

Students will investigate probability to develop problem solving skills, critical thinking, and pattern recognition, and to continue building mathematical habits of mind as we move to analyzing situations, data and trends. Throughout this unit students will ask themselves:

* What are the possible outcomes for the events in this situation?
* Are these outcomes equally likely?
* Is this a fair or unfair game?
* Can I compute the theoretical probabilities or do I conduct an experiment?
* How can I determine the probability of the outcome of one event followed by a second event?
* How can I use expected value to help me make decisions?

The unit merges well with hands on learning activities, games and other creative experiences, which can be motivating and engaging for students. Students will understand the relationship between experimental and theoretical probabilities, and be able to determine both for a given situation. Students will investigate different strategies (models) to determine sample space and probabilities and will practice with a wide array of sample problems.

This unit is important for my students because it demonstrates to students how math is used to make predictions about future events and helps students grow to be critical thinkers and problems solvers. The unit on probability, along with the next unit on data, demonstrates the answer to the age-old math question: Why do we even need to learn math? Math is one way we make sense of the world. Probability is a natural part of our world, and probability plays a major role in our decision-making. This unit shows students how we use math to model specific situations in order to make informed decisions. Students also will be dealing with different strategies to solve problems and different situations to apply these strategies. Students learn to think through a problem, assess what they already know and determine how it is relevant to the current situation, and then choose a strategy, or make a decision. My hope is that they will use this model of thinking and apply it to their own lives. Math is ever so present in life and is a critical part of our toolbox that helps us analyze and make sense of the world. My goal is for students to see the connection and relevance of math to their lives, and empower students to use their math skills and tools to make informed decisions for a better life!

**Purpose of Assessment**

“Assessment is the process of gathering evidence of student learning to inform instructional decisions” (Stiggins, 2008, p. 5). The purposes of a pre/post assessment are manifold. At the classroom level, the pre-assessment functions to collect dependable and accurate data on what students already know and to directly inform instruction. This is the primary use of the pre-assessment for the teacher. The teacher uses the pre-assessment to increase learning, diagnose students’ needs and strengths, and design and adapt future lessons. The teacher uses the post assessment to evaluate their teaching methods and instructional activity choices, and to gain a summative statement of student achievement. Accurately written post assessments that address learning targets supported by state standards provide teachers with clear data about students’ mastery of these state standards. Students use the pre-assessment to gain an understanding of what they will learn in the unit, where they are in terms of what they are required to learn, to demonstrate what they already know, and as a benchmark from which to measure their progress. Students, now understanding what is required of them in the unit, “set themselves challenging goals and maintain a strong commitment to them” (Stiggins, 2008, p. 37). Providing students with a pre-test and letting them know what is expected throughout the unit, and then providing instruction that allows them to acquire necessary skills to meet these expectations is motivating and builds efficacy (Stiggins, 2008, p. 37). The pre-assessment may be used to motivate and increase student interest, and informs students as to where they are now in relation to expectations. The post assessment provides students a summative statement on their achievement and allows students to keep track of their progress. Pre and post assessments are used together for students to realized and understand their success. Parents may use the pre assessment to understand what their student is expected to learn throughout the unit and inform them of ways they can support their student’s success at school. Parents use the post assessment to understand the level of their student’s progress and success and perhaps learn if their student requires any specialized services

According to Stiggins (2008), most of the data used for program level decisions are procured from standardized, multiple choice tests (p. 33). At a program level, the principal and district curriculum leaders may use the post assessment, which is constant across grade levels, to make high-level decisions on curriculum, professional development and resource support.

**Unit Level Learning Targets**

**Concept**: LT-1: Students will understand that probability is applied to situations that have uncertain outcomes on individual trials, but a predictable pattern of outcomes over many trials. *CCSS.Math.7.SP.5: Understand that the probability of a chance event is a number between 0 and 1 that expresses the likelihood of the event occurring.*

**Skills:** LT-2 (introduced): Students will be able to use different strategies to analyze one and two stage probability problems. *CCSS.Math.7.SP.6: Approximate the probability of a chance event by collecting data on the chance process that produce it and observing its long-run relative frequency given the probability*

*CCSS.Math.7.SP.7: Develop a probability model and use it to find probabilities of events. Compare probabilities from a model to observed frequencies; if the agreement is not good, explain possible sources of the discrepancy.*

*CCSS.Math.7. SP.8: Find probabilities of compound events using organized lists, tables, tree diagrams and simulation.*

LT-3 (introduced): Students will be able to identify the sample space (possible outcomes) in a one and two stage probability problem. *CCSS.Math.7.SP.8.b: Represent sample spaces for compound events using methods such as organized lists, tables and tree diagrams. For an event described in everyday language, identify the outcomes in the sample space, which compose the event.*

**Disposition:** LT-4: Students will feel confident and enjoy solving probability problems and using probability terms and concepts. *No math standard*

**Pre and Post Instruction Instrument**

The pre-test and post-test for the probability unit are problem solving tests involving process and performance skills. Performance assessments are very effective for skill based learning targets. Students on the pre-assessment and post-assessment are performing specific skills that reflect specific understanding and relationships. I consider the solutions, shown work, and thinking required to reach a final answer a product and process performance. The support of performance assessment for skill learning targets is clear. According to Stiggins (2008), performance based assessments are best used to assess learning targets related to performance skills and the ability to create products (pp. 86-87). Performance assessment can assess “proficiency in carrying out steps in product development (skill), and attributes of the product itself” (Stiggins, 2008, p. 162). Although not the strongest fit and preferring essay assessment for conceptual learning targets, Stiggins (2008) contends that performance assessment can also be used to measure reasoning proficiency by inference (p. 162).

The pre-test and post-test questions are very similar. The pre-test has fewer questions and the questions are simpler and shorter than the post-test questions. The post-assessment delves a bit deeper into the skill level and presents students with more complex tasks as is appropriate for a summative end of unit assessment. Both tests and their corresponding scoring guides are included.

To measure the disposition learning target, I have included a rating scale, as a form of written personal communication, where students can indicate their level of confidence and enjoyment related to mathematically probability. These rating scales and questions are the same for both tests. I will be able to use the pre and post assessments to determine student growth and progress over the course of the unit because the similar tests with similar content makes for an easy comparison.

**Bias and Distortion Discussion**

Mis-measurement is possible with any type of assessment. Sources of bias can seep into the assessment process and distort results. A fair and valid assessment depends on how clearly and appropriately the learning targets are defined. Learning targets that have not been completely defined cannot be accurately assessed. If my learning targets are unclear or imprecise, bias and distortion may result. I must also check to ensure my assessment method matches the learning target category. A proper fit is essential to obtaining accurate results. Test questions must be clearly written in student friendly language that is accessible to all students, including struggling readers and ELL students. If the text is not accessible there is no way to ensure accuracy of the assessment. I also must consider the variation of learning styles and multiple intelligences within the classroom. These assessments rely heavily on mathematical and logical multiple intelligences. Very little opportunity is provided for students with strong verbal, linguistic, musical, or naturalist skills to succeed. I also need to consider whether the questions I have included truly reflect all the knowledge, understanding and skills I want students to obtain. In addition to these, I must be aware of my individual bias towards students as I grade. I must create a firm and strict rubric or example of what I expect from each question as a demonstration of mastery and be sure that information has been adequately and effectively communicated to students. Another form of bias or distortion that may enter, but the Bellevue Public Schools and my test taking policy has eliminated is the time limitation bias and distortion. Students may, without penalty, complete any test during tutorial periods. There is also a district policy that students are not to ask questions during a test, thus eliminating too much adult guidance. The final factor involving bias and distortion that is not under the teacher’s control is student disposition and mood. Life happens and students sometimes are disturbed and distracted by life outside the classroom. When this happens a true and accurate measurement of student knowledge and understanding may be unobtainable.

Time Requirements:

Pre-Assessment: 20 min

Post-Assessment: 40 min

References

Stiggins, R. (2008). *An introduction to student-involved assessment for learning.* Upper Saddle River, New Jersey: Pearson –Prentice Hall.